Kangaroo Mother Care & Developmentally Supportive Care

IAP NEOCON 2015 - Mumbai

Suman Rao PN MD, DM
Prof & Head, Dept. of Neonatology
St. John’s Medical College, Bangalore
Why?

.........Back to basics
Back to nature
INCREASED BRAIN SIZE TO TOOL USE & LANGUAGE

BIPEDALISM & NARROWER PELVIS

... PROBLEM?

How is the bigger head going to be born out of the smaller pelvis??
Actual birth takes place at 9 months …

… which makes the human birth one year too soon:

EXCEEDINGLY IMMATURE
Kangaroo – Joey - Pinky
Brain growth – Ex utero!

- Neurogenesis
- Migration
- Arborisation
- Synaptogenesis
- Myelination
- Programmed cell death
- Competitive elimination

Timeline:
0 10 20 30 40w 6m 2y 10y 60y

Birth
Neonatal Sensory Systems

Tactile → vestibular → gustatory-olfactory → auditory → visual

- Stimulation of early maturing senses has a positive influence on late maturing senses.
- Untimely stimulation within this sequence disrupts normal maturation.
Providing a structured care environment which supports, encourages and guides the developmental organization of the premature / critically ill infant.
Developmentally Supportive Care

STRESS
How to provide DSC?
Neonatal sensory system

Tactile → vestibular → gustatory-olfactory → auditory → visual
Cutaneous system
Tactile, Proprioceptive & Kinesthetic

- Position: Prone
- Nesting
- Swaddling
- Massage
- Gentle rocking
Protection of Sleep
37 neonates assessed on multiple occasions

97 participant days

Mean birth weight - 1.67 (±0.49) kg

Mean gestational age - 34.4 (±2.86) wks
Preterms spent more time in REM sleep and less time crying
The activity occurring during REM sleep (or active sleep) seems to be particularly important to the developing organism.

Deprivation of sleep $\Rightarrow$ neuronal cell death & $\downarrow$ brain mass.

Provide a womb-like environment.
KMC reduces stress

- Collados Gomez et al
  - quasi experimental study in Spain
  - 29-34 weeks - own controls
  - Stress at base line and with KMC

- Physiological stress signals and by behavioral stress response.
  - SpO2 & HR improved. Breathing was more regular
  - trunk arching or hyperextension, very open fingers, contraction of the face muscles, apnea, irritability & exaggerated, sustained limb extension.

KMC Promotes Sleep
Protection from pain

A newborn including a preterm FEELS, RESPONDS TO and REMEMBERS pain
## Clues from baby - PIPP

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<th>Indicator</th>
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<td>&lt;28</td>
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<td>State</td>
<td>AW</td>
<td>QW</td>
<td>AS</td>
<td>QS</td>
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<td>HR increase</td>
<td>0-4</td>
<td>5-14</td>
<td>15-24</td>
<td>25</td>
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<td>SaO₂ decrease</td>
<td>0-2.4%</td>
<td>2.5-4.9%</td>
<td>5-7.4%</td>
<td>≥7.5%</td>
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<td>Brow bulge</td>
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<td>Eye squeeze</td>
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<tr>
<td>Nasolabial furrow</td>
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<tr>
<td>&lt; 6 no/minimal pain</td>
<td>&gt; 12- mod/severe pain</td>
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</table>
Pain & KMC study SJMCH 2005
NEOCON 2005, Int KMC 2008

- 20 preterm neonates
- Heel prick in KMC & in isolette
- Cross over study
- Video recording
- PIPP score
Pain during Heel Lancing

<table>
<thead>
<tr>
<th></th>
<th>KMC</th>
<th>Isolette</th>
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<tbody>
<tr>
<td>8.6</td>
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<td>10.7</td>
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</table>

KMC Isolette

P < 0.00
Pain – Behavioural Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>KMC</th>
<th>Isolette</th>
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<tbody>
<tr>
<td>Eye squeeze</td>
<td>1.56</td>
<td>2.32</td>
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<tr>
<td>Brow Bulge</td>
<td>1.56</td>
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<tr>
<td>Nasolabial furrow</td>
<td>1.56</td>
<td>2.28</td>
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</table>

KMC vs Isolette:
P<0.05
KMC position & Pain during Heel Prick – Term babies by NFCS

- Mean NFCS Score N=40

<table>
<thead>
<tr>
<th>Time</th>
<th>Control Group</th>
<th>Experimental Group</th>
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<td>Baseline Data</td>
<td>0</td>
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<td>30 Seconds</td>
<td>5.85</td>
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<td>60 Seconds</td>
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<td>1.95</td>
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<td>120 Seconds</td>
<td>1.1</td>
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Skin-to-skin care for procedural pain in neonates (Review)

Johnston C, Campbell-Yeo M, Fernandes A, Inglis D, Streiner D, Zee R

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in The Cochrane Library 2014, Issue 1

http://www.thecochranelibrary.com
Topical Anesthesia or Oral Dextrose for the Relief of Pain in Screening for Retinopathy of Prematurity: a Randomized Controlled Double-blinded Trial

by Saudamini V. Nesargi,¹ Suneetha Nithyanandam,² Suman Rao,¹ Somashekar Nimbalkar,¹ and Swarnarekha Bhat³

- RCT 20 preterm neonates
- 2 ROP screening
- ± Topical Proparacaine / 25% D
Olfactory and Gustatory system

• >32 wks detect and respond
  • Discriminate
  • Memory
  • Habituation

Which odour?...
  Breastmilk/mother/amn. fluid

  • Avoid V nerve stimulation
  • Taste Milk
EBM as analgesic study SJMCH 2010
KARNECON Award 2010

- 210 neonates
- Double blinded RCT
- 25% Dextrose, EBM, placebo
- Venipuncture
- Video recording
- PIPP score
PIPP Score

INTERVENTION
Sterile Water
EBM
25% D

N =
10
0
127
3

P 0.000
Expressed Breast Milk vs 25% Dextrose in Procedural Pain in Neonates: A Double Blind Randomized Controlled Trial

JAGDISH PRASAD SAHOO, SUMAN RAO, SAUDAMINI NESARGI, THOMAS RANJIT, ASHOK C AND SWARNAREKHA BHA
From Department of Neonatology, St John’s Medical College and Hospital, Bangalore, Karnataka, India.

Correspondence to: Dr Jagdish Prasad Sahoo, Senior Resident, Department of Pediatrics, Kalinga Institute of Medical Sciences, Bhubaneswar, Orissa, India. dr_jagdish_sahoo@yahoo.co.in
Received: December 09, 2011; Initial review: January 06, 2012: Accepted: June 23, 2012.
ROP Pain study SJMCH 2012

2012

- RCT 12 preterm neonates
- 2 ROP screening
- Topical Proparacaine control
- Proparacaine + EBM intervention
EBM is beneficial in reducing severe pain of ROP screening
CPAP- nasopharyngeal suction
EBM Vs 25 % Dextrose

NEOCON Hyderabad 2013

EBM 25 % Dextrose

Intervention
Control
Sucrose OR EBM?
Sucrose true analgesic?

Slater et al. Oral sucrose an analgesic drug for procedural pain a RCT. Lancet 2010; 376:1225-32

A. Characterisation of the nociceptive-specific brain activity

(i) Average waveform for noxious heel lance

(ii) Average waveform for non-noxious control

B. Effect of treatment on nociceptive-specific brain activity

(i) Average waveform for sucrose

(ii) Average waveform for sterile water

(iii) Comparison of weights:
- Noxious heel lance
- Non-noxious control
- Sucrose
- Sterile water

* Significant difference
Sucrose & Neurodevelopment

- > 10 doses / day in preterm
- Oxidative stress
- Poorer motor development
- Attention

EBM or Sucrose
But do we still hurt our newborns?
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<th>Procedure</th>
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<td>Removal of micropore/tegaderm</td>
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**30/08/2011 13:04**
Results

- No. of painful procedures per baby
  - \(68.54 \pm 63.7\)
- No. of painful procedures per baby/d
  - \(9.13 \pm 5.3\)
PAIN—Perception and Assessment of Painful Procedures in the NICU

by Carl Denis Britto,¹ Suman Rao PN,¹ Saudamini Nesargi,¹ Sitara Nair,² Shashidhar Rao,¹ Theradian Thilagavathy,¹ Armugam Ramesh,³ and Swarnareshka Bhat¹
It's an uphill task!
Noise is HARMFUL!
Noise study SJMCH 2006

- Tray drop
- Baby cry
- Katori drop
- Loud calling
- Rounds
- Phone ring

![Graph showing noise levels for different events](image)
- Recommended
- Excess

- Vent room: 72.13 dB
- Stable room: 77.1 dB
- Isolation: 67.5 dB
- Preterm: 61.65 dB

![Graph showing noise levels for different settings](image)
- Venti
- Incub
- P.O
- Inf.pump

- Recommended
- w.o alarm
Spectral Analysis of Noise in the Neonatal Intensive Care Unit

M.D. Livera, B. Priya, A. Ramesh, P.N. Suman Rao, V. Srilakshmi, M. Nagapoornima, A.G. Ramakrishnan, M. Dominic and Swarnarekha

St John's Medical College Hospital, Bangalore, 1Medical intelligence and language engineering laboratory, Department of Electrical engineering, Indian Institute of Science, Bangalore, India
Thank you for helping me sleep

Silence Please
Enviornmental modifications

- Rubber shoes for furniture
- Plastic files for patient records
- Closed doors between rooms
- Minimum Telephone and alarm volumes
- FM radio switched off
Efficacy of a Low Cost Protocol in Reducing Noise Levels in the Neonatal Intensive Care Unit

A. Ramesh, P.N. Suman Rao,1 G. Sandeep,1 M. Nagapoornima,3 V. Srilakshmi, M. Dominic2 and Swarnarekha

Departments of Otolaryngology, 1Pediatrics, 2Community Medicine, 3Audiology and Speech Pathology, St John’s Medical College Hospital, Bangalore, India
Continuous measurement of noise

Central area measurement

Continuous measurement
-Sound station

Continuous measurement
-Sound station
Maintaining Reduced Noise Levels in a Resource-Constrained Neonatal Intensive Care Unit by Operant Conditioning

Ventilator Room - 58 dB
Isolation Room - 51 dB
Pre-Term Room - 50 dB

21/10/2010
Adherence to Noise Reduction Protocol

Empirical Study

Sustaining a “culture of silence” in the neonatal intensive care unit during nonemergency situations: A grounded theory on ensuring adherence to behavioral modification to reduce noise levels

S. SWATHI, Resident1, A. RAMESH, Associate Professor1, M. NAGAPOORNIMA, Lecturer1, LAVINA M. FERNANDES, Lecturer2, C. JISINA, Lecturer1, P. N. SUMAN RAO, Associate Professor3, & A. SWARNAREKHA, Professor3

1Department of Otolaryngology Head & Neck Surgery, Bangalore, India, 2CMR Institute of Management Studies, Bangalore, India, and 3Department of Neonatology, St John’s Medical College Hospital, Bangalore, India
Light can be harmful

- Reduce the total light exposure
- Shade neonate’s eyes
- Use flexible point light source for procedures
- Use of dimmer light
- Cycled light: create day and night environment
Dimmer light at night
Natural light at Day
What is the Evidence ???

Level I evidence..... Meta-analysis

- ↓ length of hospital stay
- ↓ hospital costs
- ↑ weight gain
- ↓ time to full enteral feeding
- ↑ neurodevelopmental scores at 9–12 mo

Jacobs et al. 2002
Symington & Pinelli 2002
Symington & Pinelli 2006
Kangaroo Mother Care

Baby’s Right, Mothers Delight
KMC – Best Developmentally supportive care

- Visual
- Olfactory
- Auditory
- Tactile
- Vestibular
- Gustatory
- Olfactory
KMC & DSC

Core Measures of Developmental Care

Protected Sleep

Pain & Stress Assessment and Management

Developmentally Supportive Activities of Daily Living

Family-centered Care

The Healing Environment
KMC & DSC

- Evidence

3 mo........1 year....14 years.....life long?????
KMC Neurophysiological evidence

- Preterms (No KMC)
  - At term

- KMC preterms
  - At term

- Term infants

KMC – Positive influence till adolescence

Transcranial Magnetic Stimulation (TMS) outcomes:

- KMC = term infants
- KMC better than controls

*Schneider, Charpak et al. Cerebral motor functions in very premature at birth adolescents – KMC effects. Acta Pediatrca Oct 2012*
KMC for sick newborns - Sweden
KMC for sick newborns- India
KMC - best DSC

HUMANE Neonatal Care
Feel with the mother’s feelings
See through the mother’s eyes
WAKE UP………It is OVER

Thank you